In the Claims:

Please amend claims 37, 39, and 43-44 as follows.

27. A composite grating, comprising:

(a) an active material; and

(b) an ordered assemblage of subgratings supported by the active material for receiving input pulses along an input path and transmitting output pulses along an output path, wherein

(1) each subgrating satisfies a grating condition so as to diffract a respective subbandwidth of light from the input path to the output path, and

(2) the subgratings are configured such that (i) a first input optical pulse, incident to the active material along the input path and having a first prescribed input temporal waveform, produces an output optical pulse having a prescribed output temporal waveform and propagating along the output path, and (ii) a second input optical pulse, incident to the active material along the input path and having a second prescribed temporal waveform different from the first prescribed temporal waveform, does not produce an output optical pulse having the prescribed output temporal waveform and propagating along the output path.

28. The composite grating of claim 27, wherein the first input pulse and the output optical pulse at least partially spatially overlap.

29. The composite grating of claim 28 wherein the input pulses are received along the input path in an input direction and the output pulses are transmitted along the output path in a direction opposite to the input direction.

30. The composite grating of claim 27 wherein the prescribed output temporal waveform is a substantially temporally brief pulse.

31. The composite grating of claim 27 wherein the prescribed output temporal waveform corresponds to a substantially minimum temporal duration optical waveform.

32. The composite grating of claim 31 wherein the second prescribed temporal waveform is sufficiently orthogonal under cross correlation with the first prescribed temporal waveform as to produce substantially no substantially minimum temporal duration optical waveform from the composite grating when received thereby.

Cont'd C3

33. The composite grating of claim 31 wherein the second prescribed temporal waveform is sufficiently orthogonal under cross correlation with the first prescribed temporal waveform as to produce substantially no spike from the composite grating when received thereby.

Sub C2 and

34. The composite grating of claim 27 wherein the subgratings are supported on a surface of the active material, each respective subgrating satisfying the grating condition for the respective subbandwidth of light and the input path and the output path.

35. The composite grating of claim 27 wherein the subgratings comprise spatial variations in the refractive index of the active material.

36. The composite grating of claim 27 wherein the active material is a non-frequency-selective material.

37. (Amended) An optical waveform detector comprising:

(a) a detector capable of detecting light pulses having a prescribed detectable address encoded temporal waveform;

(b) a composite grating for receiving light pulses along an input path and transmitting light pulses to the detector along an output path, the composite grating comprising:

(1) an active material; and

(2) an ordered assemblage of subgratings supported by the active material wherein

(i) each respective subgrating satisfied at least one of a Bragg condition or a surficial grating condition so as to diffract a respective subbandwidth of light from the input path to the output path, and

(ii) the subgratings are so configured such that an input optical pulse interacting with the active material along the input path and having a prescribed input temporal waveform triggers an output optical pulse along the output path having the prescribed detectable temporal waveform, the prescribed detectable address encoded temporal waveform being different from the prescribed input temporal waveform.

Contd C3

38. The optical waveform detector of claim 37 wherein the subgratings are supported within a volume of the active material, each respective subgrating satisfying the Bragg condition for the respective subbandwidth of light and the input path and the output path.

Sub C4

39. (Amended) The optical waveform detector of claim 37 wherein the subgratings are supported on a surface of the active material, each respective subgrating satisfying the surficial grating condition for the respective subbandwidth of light and the input path and the output path.

40. The optical waveform detector of claim 37 wherein the input path and the output path are at least partially coextensive and wherein the input pulses travel to the composite grating in an input direction and the output pulses leave the composite grating in a direction opposite to the input direction.

41. The optical waveform detector of claim 37 wherein the subgratings comprise spatial variations in the refractive index of the active material.

42. The optical waveform detector of claim 37 wherein the active material is a non-frequency-selective material.

43. (Amended) A communications system comprising:

(a) a source of optical data; the data comprising optical light pulses, each pulse having one of a set of specific temporal waveforms;

(b) a detector capable of detecting an optical pulse having a prescribed detectable temporal waveform different from each of the set of specific temporal waveforms; and

(c) a composite grating arranged to receive the light pulses from the source and to transmit, in response thereto, output light pulses along an output path to the detector, the grating comprising an ordered assemblage of subgratings supported by an active material, wherein

(1) each respective subgrating satisfies as least one of a Bragg condition or a surficial grating condition so as to diffract a respective subbandwidth of light from the source to the output path, and

(2) the subgratings are so configured such that

(i) an optical pulse received from the source, interacting with the active material and having a prescribed one of the set of specific temporal waveforms, triggers an output optical pulse along the output path having the prescribed detectable temporal waveform, and

(ii) an optical pulse received from the source, interacting with the active material along the input path and having one of the set of specific temporal waveforms other than the prescribed one, does not trigger an output optical pulse along the output path having the prescribed detectable temporal waveform.

44. (Amended) An optical-waveform-sensitive routing system comprising:

(a) a router responsive to change the routing of data in response to an optical pulse having a prescribed detectable temporal waveform; and

(b) a composite grating for receiving input light pulses along an input path and transmitting, in response thereto, output light pulses to the router along an output path, the grating comprising an ordered assemblage of subgratings supported by an active material wherein

(1) each respective subgrating satisfies at least one of (i) a Bragg condition or (ii) a surficial grating condition so as to diffract a respective subbandwidth of light from the input path to the output path, and

(2) the subgratings are so configured such that an optical pulse received by the composite grating, interacting with the active material along the input path and having a prescribed input temporal waveform different from the prescribed detectable temporal waveform, triggers an output optical pulse along the output path having the prescribed detectable temporal waveform.

Cont'd C3

52. The composite grating of claim 27, wherein the grating condition is a Bragg condition.

Sub C4

53. The composite grating of claim 27, wherein the grating condition is a surficial grating condition.

54. The composite grating of claim 34, wherein the grating condition is a surficial grating condition.